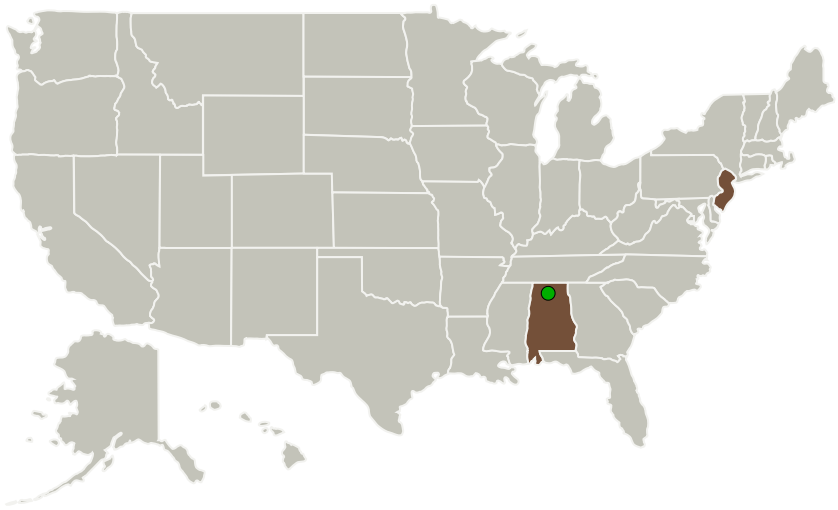
High Efficiency RF Heating for Small Nuclear Fusion Rocket Engines, Phase I

Completed Technology Project (2017 - 2018)

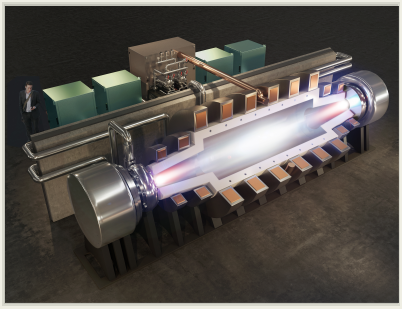
Project Introduction

High power nuclear fusion propulsion systems will require high efficiency radio-frequency heating systems in the MHz range for plasma heating. This proposal is for a novel scalable solid state Class E amplifier using Silicon Carbide switching transistors for plasma heating. This system is potentially 100% efficient compared to 40% for linear amplifiers and can be scaled to any desired size by adding additional segments in parallel. The system includes a novel closed loop feedback control system at the antenna and from the plasma. This eliminates the need for lossy transformers and other non-ideal components. The RF amplifier will be prototyped in Phase I in preparation for a plasma heating experiment in Phase II.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Princeton Satellite Systems	Lead Organization	Industry	Plainsboro, New Jersey
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama
Princeton Plasma Physics Laboratory(PPPL)	Supporting Organization	R&D Center	Princeton, New Jersey



High Efficiency RF Heating for Small Nuclear Fusion Rocket Engines, Phase I Briefing Chart Image

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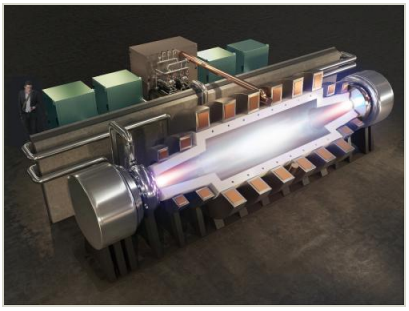
Primary U.S. Work Locations	
Alabama	New Jersey

Images



Briefing Chart Image
High Efficiency RF Heating for Small Nuclear Fusion Rocket Engines, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/127037)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Princeton Satellite Systems

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

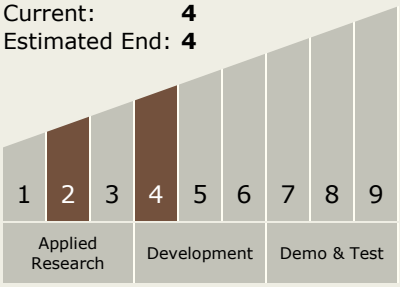
Carlos Torrez

Principal Investigator:

Michael A Paluszek

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.4 Advanced Propulsion
    - TX01.4.4 Other Advanced Propulsion Approaches

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System